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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼

To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
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02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

19980016952 MATRA Defense Espace, Velizy-Villacoublay, France

Portable Implementation of a Non Conform Multidomain Industrial CFD Code on MIMD MPP Systems

Borel, C., MATRA Defense Espace, France; Culty, B., MATRA Defense Espace, France; 1996; 10p; In English; Parallel CFD Conference 1994, 16-19 May 1994, Kyoto, Japan

Report No.(s): PB96-146923; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We present in this paper the recent developments implemented into the industrial CFD code AERLOG, developed at MATRA Defense for the use of aerodynamics studies on missile configurations with the financial support of the french MOD(Dret) and with the collaboration of the ONERA team for massively parallel implementation. The developments exposed in this paper concern both the numerical method and the parallel implementation aspects, and they represent the continuity of previous works. In the section 2, we recall a brief description of the main features of the code and of its implementation on parallel computers. The third section deals with an expansion of the multidomain approach through non conform interface: first from the numerical point of view. The fourth section is dedicated to the efforts handled towards the aim of a maximal portability: management of parallel input/output operations and introduction of an intermediate communication library. In the last section, some results of computing performances on a large scale MPP system are given and conclusions are drawn from this research study.

NTIS

Aerodynamic Configurations; Aerodynamics; Massively Parallel Processors; Parallel Computers; Parallel Processing (Computers)

19980016961 NASA Dryden Flight Research Center, Edwards, CA USA

In-Flight Flow Visualization Using Infrared Thermography Final Report

vanDam, C. P., California Univ., USA; Shiu, H. J., California Univ., USA; Banks D. W., NASA Dryden Flight Research Center, USA; Nov. 1997; 22p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC4-108

Report No.(s): NASA/CR-97-207087; NAS 1.26:207087; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The feasibility of remote infrared thermography of aircraft surfaces during flight to visualize the extent of laminar flow on a target aircraft has been examined. In general, it was determined that such thermograms can be taken successfully using an existing airplane/thermography system (NASA Dryden's F-18 with infrared imaging pod) and that the transition pattern and, thus, the extent of laminar flow can be extracted from these thermograms. Depending on the in-flight distance between the F-18 and the target aircraft, the thermograms can have a spatial resolution of as little as 0.1 inches. The field of view provided by the present remote system is superior to that of prior stationary infrared thermography systems mounted in the fuselage or vertical tail of a subject aircraft. An additional advantage of the present experimental technique is that the target aircraft requires no or minimal modifications. An image processing procedure was developed which improves the signal-to-noise ratio of the thermograms. Problems encountered during the analog recording of the thermograms (banding of video images) made it impossible to evaluate the adequacy of the present imaging system and image processing procedure to detect transition on untreated metal surfaces. The high reflectance, high thermal diffusivity, and low emittance of metal surfaces tend to degrade the images to an extent that it is very difficult to extract transition information from them. The application of a thin (0.005 inches) self-adhesive insulating film to the surface is shown to solve this problem satisfactorily. In addition to the problem of infrared based transition detection on untreated

metal surfaces, future flight tests will also concentrate on the visualization of other flow phenomena such as flow separation and reattachment.

Author

Image Processing; Remote Control; Flow Visualization; Imaging Techniques; Thermography; Temperature Measuring Instruments; Laminar Flow; Infrared Radiation

19980017071 NASA Langley Research Center, Hampton, VA USA

Static Thrust and Vectoring Performance of a Spherical Convergent Flap Nozzle with a Nonrectangular Divergent Duct

Wing, David J., NASA Langley Research Center, USA; Feb. 1998; 108p; In English

Contract(s)/Grant(s): RTOP 522-21-11-01

Report No.(s): NASA/TP-1998-206912; NAS 1.60:206912; L-17635; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The static internal performance of a multiaxis-thrust-vectoring, spherical convergent flap (SCF) nozzle with a non-rectangular divergent duct was obtained in the model preparation area of the Langley 16-Foot Transonic Tunnel. Duct cross sections of hexagonal and bowtie shapes were tested. Additional geometric parameters included throat area (power setting), pitch flap deflection angle, and yaw gimbal angle. Nozzle pressure ratio was varied from 2 to 12 for dry power configurations and from 2 to 6 for afterburning power configurations. Approximately a 1-percent loss in thrust efficiency from SCF nozzles with a rectangular divergent duct was incurred as a result of internal oblique shocks in the flow field. The internal oblique shocks were the result of cross flow generated by the vee-shaped geometric throat. The hexagonal and bowtie nozzles had mirror-imaged flow fields and therefore similar thrust performance. Thrust vectoring was not hampered by the three-dimensional internal geometry of the nozzles. Flow visualization indicates pitch thrust-vector angles larger than 10° may be achievable with minimal adverse effect on or a possible gain in resultant thrust efficiency as compared with the performance at a pitch thrust-vector angle of 10 deg.

Author

Thrust Vector Control; Nozzle Geometry; Convergent Nozzles; Angular Distribution; Flow Distribution; Flapping; Pitch (Inclination)

19980017088 NASA Langley Research Center, Hampton, VA USA

Flow and Turbulence Modeling and Computation of Shock Buffet Onset for Conventional and Supercritical Airfoils

Bartels, Robert E., NASA Langley Research Center, USA; Feb. 1998; 40p; In English

Contract(s)/Grant(s): RTOP 522-32-21-01

Report No.(s): NASA/TP-1998-206908; NAS 1.60:206908; L-17599; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flow and turbulence models applied to the problem of shock buffet onset are studied. The accuracy of the interactive boundary layer and the thin-layer Navier-Stokes equations solved with recent upwind techniques using similar transport field equation turbulence models is assessed for standard steady test cases, including conditions having significant shock separation. The two methods are found to compare well in the shock buffet onset region of a supercritical airfoil that involves strong trailing-edge separation. A computational analysis using the interactive-boundary layer has revealed a Reynolds scaling effect in the shock buffet onset of the supercritical airfoil, which compares well with experiment. The methods are next applied to a conventional airfoil. Steady shock-separated computations of the conventional airfoil with the two methods compare well with experiment. Although the interactive boundary layer computations in the shock buffet region compare well with experiment for the conventional airfoil, the thin-layer Navier-Stokes computations do not. These findings are discussed in connection with possible mechanisms important in the onset of shock buffet and the constraints imposed by current numerical modeling techniques.

Author

Boundary Layers; Turbulence Models; Buffeting; Mathematical Models; Navier-Stokes Equation; Supercritical Airfoils

19980017099 Naval Surface Warfare Center, Weapons Systems Dept., Dahlgren, VA USA

An Improved Semiempirical Method for Calculating Aerodynamics of Missiles with Noncircular Bodies

Moore, Frank G., Naval Surface Warfare Center, USA; McInville, Roy M., Naval Surface Warfare Center, USA; Hymer, Tom, Naval Surface Warfare Center, USA; Sep. 1997; 139p; In English

Report No.(s): AD-A332183; NSWCDD-TR-97-20; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

An improved method has been developed to compute aerodynamics of noncircular cross section shapes. The improved method is based on extending current state of the art methods for computing aerodynamics of noncircular wing-body shapes based on circular wing-body methods. Specific additions to the state of the art methods presently in use include extensions to a broader class of cross section bodies and to a higher angle of attack (AOA); extensions to allow improved accuracy at low cross flow Mach

number and to allow body cross section shape to impact the critical cross flow Reynolds number; and a method to treat wing-body interference factor corrections as a function of body geometry, Mach number, and AOA. The new methods were applied to a broad class of noncircular body alone and wing body configurations for which wind tunnel data were available. In general, results for normal force, axial force and center of pressure were quite good over the Mach number and AOA range where data was available. This included Mach numbers as low as 0.3 and as high as 14 and AOAs to 60 degrees.

DTIC

Aerodynamic Configurations; Angle of Attack; Body-Wing Configurations; Interactional Aerodynamics; Loads (Forces); Mach Number; Missiles; Reynolds Number

19980017180 NASA Lewis Research Center, Cleveland, OH USA

Physical Mechanisms of Glaze Ice Scallop Formations on Swept Wings

Vargas, Mario, NASA Lewis Research Center, USA; Reshotko, Eli, Case Western Reserve Univ., USA; Jan. 1998; 34p; In English; 36th; Aerospace Sciences, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. for Research, USA

Contract(s)/Grant(s): RTOP 548-20-23

Report No.(s): NASA/TM-1998-206616; NAS 1.15:206616; E-11037; AIAA Paper-98-0491; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experiment was conducted to understand the physical mechanisms that lead to the formation of scallops on swept wings. Icing runs were performed on a NACA 0012 swept wing tip at 45 deg, 30 deg, and 15 deg sweep angles. A baseline case was chosen and direct measurements of scallop height and spacing, castings, video data and close-up photographic data were obtained. The results showed the scallops are made of glaze ice feathers that grow from roughness elements that have reached a minimum height and are located beyond a given distance from the attachment line. This distance depends on tunnel conditions and sweep angle, and is the critical parameter in the formation of scallops. It determines if complete scallops, incomplete scallops or no scallops are going to be formed. The mechanisms of growth for complete and incomplete scallops were identified. The effect of velocity, temperature and LWC on scallop formation was studied. The possibility that cross flow instability may be the physical mechanism that triggers the growth of roughness elements into glaze ice feathers is examined.

Author

Ice Formation; Swept Wings; Cross Flow; Vortices; Sweep Angle; Temperature Effects; Glazes; Flow Stability

19980017203 Naval Postgraduate School, Monterey, CA USA

Experimental and Computational Analysis of Separation Bubble Behavior for Compressible Steady and Oscillatory Flows Over a NACA 0012 Airfoil ($M=0.3$, $Re=540,000$)

Vandyken, Robert D., Naval Postgraduate School, USA; Mar. 1997; 202p; In English

Report No.(s): AD-A331903; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

In this thesis, the separation bubble behavior and its effect on the steady and dynamic stall characteristics of a thin airfoil in a compressible flow at a transitional Reynolds number was studied. For such flows, laminar separation occurs near the airfoil leading edge, but turbulent reattachment occurs within a short distance downstream, forming a separation bubble in the underlying region. Two experimental techniques, Point Diffraction Interferometry (PDI) and Laser Doppler Velocimetry (LDV), were used to acquire detailed flowfield information that showed the development of the leading-edge separation bubble and its subsequent bursting at higher angles of attack. The initiation of the stall process from the leading-edge separation bubble as opposed to trailing-edge flow reversal pointed to the need for transitional flow analysis. Both in the boundary layer and Reynolds-averaged, Navier-Stokes (N-S) analysis methods, transition models were incorporated to determine the location and extent of the transition zone that best modeled the measured separation bubble behavior. Computed results for steady flow gave remarkable agreement with the measurements.

DTIC

Vortex Shedding; Computational Fluid Dynamics; Data Acquisition; Numerical Analysis; Bubbles; Boundary Layer Separation

19980017285 Syracuse Univ., Dept. of Mechanical, Aerospace and Manufacturing Engineering, NY USA

Evaluation of 3D Inverse Code Using Rotor 67 as Test Case Final Report

Dang, T., Syracuse Univ., USA; Feb. 02, 1998; 19p; In English

Contract(s)/Grant(s): NAG3-1933

Report No.(s): NASA/CR-1998-206994; NAS 1.26:206994; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A design modification of Rotor 67 is carried out with a full 3D inverse method. The blade camber surface is modified to produce a prescribed pressure loading distribution, with the blade tangential thickness distribution and the blade stacking line at mid-chord kept the same as the original Rotor 67 design. Because of the inviscid-flow assumption used in the current version of the

method, Rotor 67 geometry is modified for use at a design point different from the original design value. A parametric study with the prescribed pressure loading distribution yields the following results. In the subsonic section, smooth pressure loading shapes generally produce blades with well-behaved blade surface pressure distributions. In the supersonic section, the study shows that the strength and position of the passage shock correlate with the characteristics of the blade pressure loading shape. In general, "smooth" prescribed blade pressure loading distributions generate blade designs with reverse cambers which have the effect of weakening the passage shock.

Derived from text

Inviscid Flow; Rotors; Computer Programs; Pressure Distribution; Pressure

19980017304 Naval Postgraduate School, Monterey, CA USA

A Fundamental Study of Compressibility Effects on Dynamic Stall of Fixed and Adaptive Airfoils *Final Report*

Chandrasekhara, M. S., Naval Postgraduate School, USA; Sep. 08, 1997; 46p; In English

Report No.(s): AD-A332480; ARO-32480.12-EG; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A three year research effort on 'A Fundamental Study of Compressibility Effects on Dynamic Stall of Fixed and Adaptive Airfoils' was initiated in 1994. The research led to an understanding of: some of the key mechanisms of compressible dynamic stall including when the flow over the airfoil is transonic; the Reynolds number effects which strongly affect the detailed flow physics making extension of laboratory results to full-scale conditions extremely challenging, and the role of transition and a need to model it properly in computations. Further, the results demonstrated the major role of the airfoil leading edge curvature in producing the flow gradients that are responsible for dynamic stall onset, which enabled the development of a dynamically developing leading edge (DDLE) airfoil for effective flow control by modifying the vorticity field in the flow. The significant results of the effort are summarized in this report.

DTIC

Aerodynamic Stalling; Fluid Dynamics; Leading Edges; Reynolds Number; Vorticity

19980017535 NASA Lewis Research Center, Cleveland, OH USA

Design and Performance Calculations of a Propeller for Very High Altitude Flight

Koch, L. Danielle, NASA Lewis Research Center, USA; Feb. 1998; 130p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 529-10-13

Report No.(s): NASA/TM-1998-206637; E-11102; NAS 1.15:206637; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Reported here is a design study of a propeller for a vehicle capable of subsonic flight in Earth's stratosphere. All propellers presented were required to absorb 63.4 kW (85 hp) at 25.9 km (85,000 ft) while aircraft cruise velocity was maintained at Mach 0.40. To produce the final design, classic momentum and blade-element theories were combined with two and three-dimensional results from the Advanced Ducted Propfan Analysis Code (ADPAC), a numerical Navier-Stokes analysis code. The Eppler 387 airfoil was used for each of the constant section propeller designs compared. Experimental data from the Langley Low-Turbulence Pressure Tunnel was used in the strip theory design and analysis programs written. The experimental data was also used to validate ADPAC at Reynolds numbers of 60,000 and a Mach number of 0.20. Experimental and calculated surface pressure coefficients are compared for a range of angles of attack. Since low Reynolds number transonic experimental data was unavailable, ADPAC was used to generate two-dimensional section performance predictions for Reynolds numbers of 60,000 and 100,000 and Mach numbers ranging from 0.45 to 0.75. Surface pressure coefficients are presented for selected angles of attack, in addition to the variation of lift and drag coefficients at each flow condition. A three-dimensional model of the final design was made which ADPAC used to calculate propeller performance. ADPAC performance predictions were compared with strip-theory calculations at design point. Propeller efficiency predicted by ADPAC was within 1.5% of that calculated by strip theory methods, although ADPAC predictions of thrust, power, and torque coefficients were approximately 5% lower than the strip theory results. Simplifying assumptions made in the strip theory account for the differences seen.

Author

Propellers; Propeller Efficiency; Performance Prediction; Low Reynolds Number; Aerodynamic Coefficients; Navier-Stokes Equation; Numerical Analysis; Prop-Fan Technology; Angle of Attack

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19980016923 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Transportation Initial Decisions and Orders and Board Opinions and Orders Adopted and Issued during the Month of December 1995

Dec. 1995; 234p; In English

Report No.(s): PB95-916712; NTSB/IDBOO-95/12; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for December 1995.

NTIS

Air Transportation; Accident Prevention; Aerospace Safety

19980016949 Thomas Lane and Associates, Seattle, WA USA

Montana Airport Multimodal Study, Part 2, Analysis and Recommendations Final Report, Jun. 1994 - Mar. 1996

Lane, Theodore, Thomas Lane and Associates, USA; Mar. 1996; 41p; In English

Report No.(s): PB96-165063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report uses information from a household survey and an airport managers's survey conducted by the University of Montana's Bureau of Business and Economic Research (UM/BBER) to: (1) conduct a multimodal activity analysis that identifies and defines airport multimodal activity in Montana, (2) conduct a multimodal methods and strategies analysis, including the presentation of recommendations on methods and strategies to enhance airport multimodal activity, and (3) conduct a multimodal efficiency analysis that evaluates the potential benefits resulting from increased multimodal efficiency analysis that evaluates the potential benefits resulting from increased multimodalism at Montana's airports.

NTIS

Airports; Economics

19980016974 Montana State Univ., Bureau of Business and Economic Research, Missoula, MT USA

Montana Airport Multimodal Study, Part 1, Methods and Results Final Report, Jun. 1994 - Nov. 1995

Sylvester, J. T., Montana State Univ., USA; Wallwork, S. S., Montana State Univ., USA; Polzin, P. E., Montana State Univ., USA; Nesary, M., Montana State Univ., USA; Nov. 1995; 26p; In English

Report No.(s): PB96-165071; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study examines the representative Montanans' awareness of multimodal transportation opportunities and looks at their usage of airports in the Montana economy. This study is based on a random survey of 1225 Montana households.

NTIS

Airports; Surveys

19980016994 National Transportation Safety Board, Washington, DC USA

Aviation Safety in Alaska: Safety Study

Nov. 1995; 124p; In English

Report No.(s): PB95-917006; NTSB/SS-95/03; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Flight operations in Alaska are diverse, and they are responsive to the State's challenging aviation environment and its unique air transportation requirements. The National Transportation Safety Board conducted this study to examine Alaska's current aviation environment and air transportation activities, to identify the associated risk factors and safety deficiencies, and to recommend practical measures for managing the risks to safe flight operations given the reality of Alaska's aviation environment and the potential of new technologies. The following safety issues are discussed in the study: (1) the operational pressures on pilots and commercial operators to provide reliable air service in an operating environment and aviation infrastructure that are often inconsistent with these demands; (2) the adequacy of weather observing and reporting; (3) the adequacy of airport inspections and airport condition reporting; (4) the potential effects on safety of current regulations for pilot flight, duty, and the rest time applicable to commuter airlines and air taxis in Alaska; (5) the adequacy of the current instrument flight rules system and the

enhancements needed to reduce the reliance of Alaska's commuter airlines and air taxi operations on visual flight rules: and (6) the needs of special aviation operations in Alaska.

NTIS

Air Transportation; Aircraft Safety; Airline Operations; Civil Aviation; Commercial Aircraft; Flight Operations; Flight Safety; Inspection; Regulations

19980017027 NASA Washington, Washington, DC USA

Aerospace Safety Advisory Panel Annual Report

Feb. 1998; 94p; In English

Report No.(s): NASA/TM-97-207048; NAS 1.15:207048; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

During 1997, the Aerospace Safety Advisory Panel (ASAP) continued its safety reviews of NASA's human space flight and aeronautics programs. Efforts were focused on those areas that the Panel believed held the greatest potential to impact safety. Continuing safe Space Shuttle operations and progress in the manufacture and testing of primary components for the International Space Station (ISS) were noteworthy. The Panel has continued to monitor the safety implications of the transition of Space Shuttle operations to the United Space Alliance (USA). One area being watched closely relates to the staffing levels and skill mix in both NASA and USA. Therefore, a section of this report is devoted to personnel and other related issues that are a result of this change in NASA's way of doing business for the Space Shuttle. Attention will continue to be paid to this important topic in subsequent reports. Even though the Panel's activities for 1997 were extensive, fewer specific recommendations were formulated than has been the case in recent years. This is indicative of the current generally good state of safety of NASA programs. The Panel does, however, have several longer term concerns that have yet to develop to the level of a specific recommendation. These are covered in the introductory material for each topic area in Section 11. In another departure from past submissions, this report does not contain individual findings and recommendations for the aeronautics programs. While the Panel devoted its usual efforts to examining NASA's aeronautic centers and programs, no specific recommendations were identified for inclusion in this report. In lieu of recommendations, a summary of the Panel's observations of NASA's safety efforts in aeronautics and future Panel areas of emphasis is provided. With profound sadness the Panel notes the passing of our Chairman, Paul M. Johnstone, on December 17, 1997, and our Staff Assistant, Ms. Patricia M. Harman, on October 5, 1997. Other changes to the Panel composition during the past year were: the resignation of Mr. Dennis E. Fitch as a Consultant; the appointment of Mr. Roger D. Schaefe as a Consultant; and the assignment of Ms. Susan M. Smith as Staff Assistant.

Derived from text

Aerospace Safety; Space Transportation System Flights; Performance Tests; NASA Programs; Safety; Space Shuttles

19980017097 Industrial Coll. of the Armed Forces, Washington, DC USA

Air Transportation: Elements of a Changing Environment and What It Means to the Civil Reserve Air Fleet Topical Report

Daly, John D., Industrial Coll. of the Armed Forces, USA; Apr. 1997; 50p; In English

Report No.(s): AD-A331472; NDU-ICAF-97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The commercial air carrier industry is vitally important to the nation's rapid mobilization capability. In times of war or national emergency, when the Civil Reserve Air Fleet or CRAF is fully activated, participating air carriers contribute over 50 percent of the nation's airlift capacity. In peacetime too, the CRAF carriers are employed by the military to provide airlift services moving military passengers, equipment and supplies. Commercial augmentation is becoming increasingly more important as the nation remains engaged in many parts of the world and the military airlift fleet becomes smaller. The changes occurring within the air transportation industry are troubling and may limit CRAF's ability to mobilize in the future. The military logistics environment is changing. DOD logistics is in a period of transition shifting from a strategy of 'just-in-case' to more 'just-in-time' and as a result is reducing inventory. Much of this strategy is dependent upon rapid delivery of essential parts and supplies by using air transportation to reduce delivery time. to leverage CRAF participation, DOD is linking the opportunity for this new government transportation business to CRAF members. With less inventory and more of it moving by CRAF carriers does this practice expose the DOD supply channels to critical failure in the event CRAF must be activated? This author believes it does.

DTIC

Air Transportation; Logistics; Civil Aviation

19980017103 Eurocontrol Experimental Centre, Bretigny, France

Coverage of 1996 European Air Traffic for the Base of Aircraft Data (BADA)

Bos, A., Eurocontrol Experimental Centre, France; Apr. 1997; 40p; In English

Report No.(s): PB98-114861; EEC/NOTE-10/97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The air traffic statistics in the European CRCO area for 1996 are used to determine the coverage of European air traffic by the Base of Aircraft Data (BADA) Revision 2.5. BADA consists of a set of aircraft models used at the EEC and other European research institutes for aircraft trajectory simulation. The results show that 69 aircraft types within BADA 2.5 cover 88.9% of the European air traffic. The addition of 2 types would bring the coverage to the target of 90%.

NTIS

Trajectory Optimization; Air Traffic; Data Bases; Research Aircraft

19980017134 NYMA, Inc., Egg Harbor, NJ USA

Test and Evaluation Plan of Computer-Based Training for the CTX 5000 Explosives Detection System Final Report

Cormier, S., NYMA, Inc., USA; Fobes, J. L., NYMA, Inc., USA; Sep. 1996; 60p; In English

Contract(s)/Grant(s): DTFA03-94-C-00012

Report No.(s): PB97-151963; DOT/FAA/AR-96/67; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This Test and Evaluation Plan evaluates the effectiveness of computer-based training (CBT) as an element of a Screener Proficiency Evaluation and Reporting System (SPEARS) for checked baggage screening with the CTX 5000. The CTX 5000 combines computed tomography imaging and automated detection of explosives. Alarm resolution with this complex system requires that screeners learn to skillfully discriminate system false alarms from system-identified true threats. Testing is designed to determine the effectiveness of the CBT to meet the critical operational and technical issues described in this plan.

NTIS

Computer Assisted Instruction; Training Devices; Explosives Detection; Training Evaluation; Computer Aided Tomography; Airport Security

19980017351 National Transportation Safety Board, Office of Research and Engineering, Washington, DC USA

Annual Review of Aircraft Accident Data; U.S. General Aviation, Calendar Year 1994

Feb. 01, 1996; 85p; In English

Report No.(s): PB96-138169; NTSB/ARG-96/01; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report presents a statistical compilation and review of general aviation accidents which occurred in 1994 in the USA, its territories and possessions, and in international waters. The accidents reported are all those involving U.S. registered aircraft not conducting operations under 14 CFR 121, 14 CFR 127, or 14 CFR 135. This report is divided into five sections: All Accidents; Fatal Accidents; Serious Injury Accidents; and Property Damage Accidents and Midair Collision Accidents. Several tables present accident parameters for 1994 accidents only, and each section includes tabulations which present comparative statistics for 1994 and for the ten-year period 1984-1993.

NTIS

General Aviation Aircraft; Aircraft Accidents

19980017521 Minnesota Univ., Center for Transportation Studies, Minneapolis, MN USA

Shifting Global Airline Service and the Local Community Final Report

Loughlin, M. J., Minnesota Univ., USA; Adams, J. S., Minnesota Univ., USA; Jan. 1996; 112p; In English

Report No.(s): PB96-155221; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report presents results from a one-year study investigating the allocation, organization, and importance of international passenger and freight service among US cities. Minneapolis-St. Paul International Airport (MSP) serves as a case study throughout. The study addressed specific causes and effects of the international air service MSP currently enjoys. The goal of this report is to inform public policy decision-makers, business leaders, and private citizens about international air service at MSP: the regulatory framework that shapes the international service map, connections between such service and urban development, and Minneapolis/St. Paul's standing among other Midwestern cities in terms of access to major foreign destinations. The final section of this report comments on the tenuous nature of nonstop international service in today's liberal international environment, current efforts to enhance international service to the Twin Cities, and questions that remain unanswered about the Twin Cities place on the international service map.

NTIS

Airline Operations; International Cooperation; Air Transportation; Management Planning

19980017541 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aircraft Accident Report: Uncontrolled Collision with Terrain, Flagship Airlines, Inc., dba American Eagle Flight 3379, BAe Jetstream 3201, N918AE, Morrisville, North Carolina, December 13, 1994

Oct. 24, 1995; 116p; In English

Report No.(s): PB95-910407; NTSB/AAR-95/07; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The report explains the accident involving American Eagle flight 3379, a BAe Jetstream 3201, which crashed about 4 nautical miles southwest of the runway 5L threshold during an instrument landing system approach to the Raleigh-Durham International Airport on December 13, 1994. Safety issues examined in the report include flightcrew decisions and training, air carrier organization, hiring and record keeping practices, Federal Aviation Administration surveillance of AMR Eagle/Flagship, and the flight profile advisory system. Safety recommendations concerning these issues were made to the Federal Aviation Administration.

NTIS

Aircraft Accidents; Aircraft Accident Investigation

19980017561 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aircraft Accident Report: Runway Collision Involving Transworld Airlines Flight 427 and Superior Aviation Cessna 441, Bridgeton, Missouri, November 22, 1994

Aug. 30, 1995; 164p; In English

Report No.(s): PB95-910405; NTSB/AAR-95/05; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report explains the runway collision of Trans World Airlines flight 427, a McDonnell Douglas DC-9-82, and N441KM, a Cessna 441, at the intersection of runway 30R and taxiway Romeo at the Lambert-St. Louis International Airport in Bridgeton, Missouri. The safety issues discussed in the report include aircraft lighting and conspicuity; airport markings, signs, and lighting; runway 31 designation, utilization, displaced threshold; ATC and pilot phraseology (specifically, the term 'back-taxi'); pilot training, runway incursion detection/prevention methods; and ASDE/AMASS development. Safety recommendations concerning some of these issues were made to the Federal Aviation Administration (FAA).

NTIS

Aircraft Accidents; Collisions; Aircraft Accident Investigation; Air Traffic Control

19980017656 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Transportation. Initial Decisions and Orders and Board Opinions and Orders: Adopted and Issued during the Month of October 1995

Oct. 1995; 245p; In English

Report No.(s): PB95-916710; NTSB/IDBOO-95/10; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for October 1995.

NTIS

Air Transportation; Safety Management

19980017657 NERAC, Inc., Tolland, CT USA

Accident Reconstruction. (Latest Citations from the Ei Compendex*Plus Database)

Mar. 1996; In English

Report No.(s): PB96-866165; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning modeling techniques and other methods of reconstructing traffic and aircraft accidents. Topics include photogrammetry, forensic evidence, impact computer programming, stereoscopic and video animation, and mathematical modeling. The accident of the space shuttle, Challenger, is specifically referenced. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Aircraft Accidents; Accident Investigation; Bibliographies

19980017673 National Aerospace Lab., Flight Div., Amsterdam, Netherlands

Evaluation of Approach and Landing Factors Influencing Airport Safety

Khatwa, R., National Aerospace Lab., Netherlands; Roelen, A. L., National Aerospace Lab., Netherlands; Karwal, A. K., National Aerospace Lab., Netherlands; Enders, J. H., National Aerospace Lab., Netherlands; Dodd, R., National Aerospace Lab., Netherlands; Mar. 27, 1996; 18p; In English; European Aviation Safety Seminar Challenges and Solutions, 27-29 Feb. 1996, Amsterdam, Netherlands; Sponsored by Flight Safety Foundation, Inc., USA

Report No.(s): PB97-204788; NLR-TP-96221-U; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This exploratory study examined some of the factors that influence approach and landing safety at principal international airports, especially as regards the influence on risk of fully-functioning precision terminal approach and guidance equipment. The objective was to quantify the degree to which these factors are associated with the risk of an accident. Accident and movement data for 557 ICAO Principal Airports for decade 1984-1993 were evaluated for the risk analysis. The accident sample comprised 132 hull loss occurrences. The study concludes that precision approaches confer a risk advantage of about five over non-precision approaches absent other factors on a world-wide basis.

NTIS

Aircraft Landing; Aircraft Accidents; Risk; Evaluation; Approach; Airports; Safety

19980017678 Federal Aviation Administration, Research and Special Programs Administration, Cambridge, MA USA

Enplanement and All Cargo Activity, Calendar Year 1994 Final Report

Glasgow, S., Federal Aviation Administration, USA; OLeary, P., Federal Aviation Administration, USA; Masalsky, J., Federal Aviation Administration, USA; Jan. 1996; 213p; In English

Report No.(s): PB96-157185; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The Enplanement and All Cargo Activity report, published annually, is a compilation of reports available from the Air Carrier Activity Information System (ACAIS). The ACAIS is managed by the Department of Transportation's Volpe National Transportation Systems Center (Volpe Center) in support of the Federal Aviation Administration's Airport Improvement Program (AIP). The report summarizes enplanement activity at over 2,000 US airports and all-cargo activity at over 100 US airports. AIP entitlement funds are also identified for calendar year 1994.

NTIS

Air Traffic; Air Transportation; Cargo

19980017702 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aircraft Accident Report: Crash during Emergency Landing, Phoenix Air, Learjet 35A, N521PA, Fresno, California, December 14, 1994

Aug. 01, 1995; 74p; In English

Report No.(s): PB95-910404; NTSB/AAR-95/04; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The report explains the accident involving the Phoenix Air Learjet 35A that crashed while attempting an emergency landing at Fresno Air Terminal, Fresno, California, on December 14, 1994. Safety issues in the report focused on maintenance, inspection and quality assurance. Safety recommendation concerning these issues were made to the Federal Aviation Administration, Phoenix Air, and the Department of Defense.

NTIS

Aircraft Accident Investigation; Lear Jet Aircraft; Aircraft Accidents; Crashes

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19980016934 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Special Investigation Report: Air Traffic Control Equipment Outages

Jan. 23, 1996; 44p; In English

Report No.(s): PB96-917001; NTSB/SIR-96/01; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

This report examines the outages involving computer and related equipment in certain air route traffic control centers (ARTCCs). The safety issues discussed in the report include the increasing frequency of outages involving the aging IBM 9020E computer equipment; other equipment outages involving power systems and communications equipment unrelated to the aging IBM computer systems; lack of controller proficiency with one of the backup computer systems; the increased likelihood that some ARTCC computer systems will be operated with compromised redundancy; and the adverse effect of the retirement of highly skilled airways facilities technicians on the Federal Aviation Administration's (FAA) ability to maintain and repair many air traffic control systems. Safety recommendations concerning these issues were made to the FAA.

NTIS

Air Traffic Control; Control Equipment; Air Transportation; Controllers; Safety Management

19980017009 Eurocontrol Experimental Centre, Bretigny, France

Space System Safety Case: EGNOS Space System Safety Case-Outline, Volume 2

Daniels, D., Eurocontrol Experimental Centre, France; Fletcher, P. A., Eurocontrol Experimental Centre, France; Jun. 1997; 64p; In English

Report No.(s): PB98-114846; EEC-312-V2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Volume II of this report forms deliverable 2 of the Impact Study on the Introduction of a Space System Safety Case into the safety regulation of radio navigation services. It presents an outline of the Space System Safety Case (SSC) for the European Geostationary Navigation Overlay Service (EGNOS).

NTIS

Radio Navigation; Satellite Navigation Systems; Civil Aviation; Safety Management; Safety Factors; Systems Engineering

19980017050 Coast Guard Academy, Dept. of Engineering, New London, CT USA

Magnetic Loop Based LORAN Receiver for Urban Canyon Applications Final Report

Peterson, B. B., Coast Guard Academy, USA; McKaughan, M., Coast Guard Academy, USA; Heye, S., Coast Guard Academy, USA; Mendoza, J., Coast Guard Academy, USA; Leone, D., Coast Guard Academy, USA; Novick, Yukie, Integrated Systems Research Corp., USA; Dykstra, Kenneth U., Integrated Systems Research Corp., USA; Miller, Lance C., Science Applications International Corp., USA; Jan. 1997; 377p; In English

Report No.(s): PB97-169114; USCGA-01-97; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche

During the summer of 1996, the Office of National Drug Control Policy, the British Home Office, and the Defense Advanced Research Projects Agency funded the development of a digital H-field LORAN receiver and joint United States/UK radionavigation experiments to determine the accuracy, repeatability, and availability of LORAN in urban locations. The data measured in this experiment were taken using an H-field LORAN receiver. Details are presented of the US Coast Guard Academy developed all digital H-field LORAN receiver which accepts a precise oscillator input to produce a two station time-of-arrival (TOA) fix if three stations are not available. In addition, the results of extensive LORAN, GPS, and GPS/GLONASS testing in urban canyons are represented. The first experiments were performed in London utilizing a van supplied by the UK and outfitted by a joint U.S./U.K. team. The second set of experiments were performed in the New York City area. The New York data collected over a two week period also indicated the receiver could consistently correctly acquire and provide fixes of accuracy comparable to GPS SPS.

NTIS

Ground Truth; LORAN; Cities; Global Positioning System; Radio Receivers; Radio Reception; Radio Signals; Navigation Instruments

19980017078 Naval Research Lab., Washington, DC USA

Truetime MK-V 151-301-522 P/Y Code GPS Receiver Live Static Test

Powers, Edward D., Naval Research Lab., USA; Jones, Edward C., Naval Research Lab., USA; Brad, Jimmie, Naval Research Lab., USA; Nov. 24, 1997; 37p; In English

Report No.(s): AD-A332380; NRL/MR/8150--97-8114; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The GPS Program Offices, Los Angeles Air Force Base, California, has established a Center of Expertise (COE) comprised of several agencies, each providing unique GPS test capabilities for the purpose of developing a Commercial Receiver Test Program (CRTP). The Responsible Test Organization (RTO) for the COE is the 746th Test Group, 46th Guidance Test Squadron, Holloman Air Force Base, New Mexico. The Naval Research Laboratory (NRL) has been designed as a COE with the responsibility of testing the time output characteristics and accuracy of the commercial receivers. The NRL clock testing facility has time traceable to the U.S. Naval Observatory and the procedures used are taken from the CORE INS/GR/EGI TEST PLAN prepared by RTO.

DTIC

Global Positioning System; Observatories; Receivers; Static Tests

19980017102 Eurocontrol Experimental Centre, Bretigny, France

EATCHIP 3 Evaluation and Demonstration. Phase 2. Experiment 1: Civil/Military Co-ordination Final Report

Dorbes, A., Eurocontrol Experimental Centre, France; Aug. 1997; 78p; In English

Report No.(s): PB98-114879; EEC-318; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report describes the evaluation of system support for Civil/Military co-ordination, consisting of flight data exchange between civil and military ATS units, and airspace crossing co-ordination messages. Concept, and general HMI presentation and

interaction principles were well received. The effect of the system supported crossing function appeared beneficial in that it facilitated and expedited civil/military exchanges, as compared to the current French operational situation.

NTIS

Civil Aviation; Coordination; Evaluation; Experimentation; Air Traffic Control; Control Systems Design; Military Technology

19980017320 Arizona Dept. of Transportation, Transportation Research Center, Phoenix, AZ USA

Cost Effectiveness and Magnitude of Potential Impact of Various Congestion Management Measures

Rowell, M., Arizona Dept. of Transportation, USA; Buonincontri, F., Arizona Dept. of Transportation, USA; Semmens, J., Arizona Dept. of Transportation, USA; Mar. 1997; 89p; In English

Report No.(s): PB97-155568; FHWA-AZ-97-453; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Phoenix and Tucson are 'non-attainment' areas under the EPA's air quality guidelines. Vehicle traffic is the main man-made source of the region's air quality problems. Various methods for reducing the vehicular contribution to air pollution are constantly under consideration and debate. The potential impact on air quality of each measure varies. Each measure also has a different price associated with it. At the same time, there are limited resources available to fund these measures. The original contribution of this report is contained in the translation of congestion abatement impacts into air quality impacts. The air quality estimates are calculated using numbers specific to Phoenix and Tucson. The methodology permits comparison of the available congestion abatement options by the potential magnitude of emissions reductions and by cost-effectiveness of removing pollutants. The near term (within five years) results are summarized in the Tables A1 through A4, for Phoenix and Tucson, respectively. The purpose of this report is to provide policy makers with a guide to options that are available to reduce congestion that may lead to a more cost-effective program for reducing vehicle generated air pollution.

NTIS

Congestion; Air Quality; Air Pollution; Traffic; Motor Vehicles

19980017579 NERAC, Inc., Tolland, CT USA

LORAN C Navigation. (Latest citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867791; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning LORAN C for air and maritime navigation. Topics include coastal confluence on inland waters, automatic vehicle location and tracking, distress systems, portable land position location, meteorological and atmospheric data acquisition, time and frequency synchronization, and position fixing. Various LORAN C equipment and signal propagation devices are also examined.

NTIS

LORAN C; Frequency Synchronization; Meteorological Instruments; Navigation; Automatic Control; Air Navigation

19980017698 National Academy of Sciences - National Research Council, Aeronautics and Space Engineering Board, Washington, DC USA

Global Positioning System for the Geosciences: Summary and Proceedings of a Workshop on Improving the GPS Reference Station Infrastructure for Earth, Oceanic, and Atmospheric Science Applications

1997; 258p; In English; Global Positioning System for the Geosciences, 11-12 Mar. 1996, Boulder, CO, USA

Report No.(s): NASA/TM-97-206792; NAS 1.15:206792; PB98-109895; Copyright Waived; Avail: CASI; A12, Hardcopy; A03, Microfiche

This report, which represents the results of the workshop, is divided into two sections. Section I includes an executive summary, a chapter introducing the reader to GPS and its usefulness for Earth, oceanic, and atmospheric research, and four chapters summarizing the themes of the workshop presentations, poster papers, and working group discussions. Section II contains the proceedings of the workshop and is divided into five chapters corresponding to the five categories of invited papers written by workshop speakers and authors of poster papers. The appendices contain additional information about the workshop and the Steering Committee.

NTIS

Global Positioning System; Conferences; Oceanography; Earth Sciences; Atmospheric Physics; Geology; Geophysics

19980017934 Aeronautical Systems Div., Wright-Patterson AFB, OH USA

Specification for USAF Standard Form, Fit, and Function (F3) Medium Accuracy Inertial Navigation Unit, Revision D

Sep. 21, 1992; 300p; In English

Report No.(s): AD-A332939; ASD-SNU-84-1-Rev-D; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This specification establishes the requirements in terms of Form, Fit, and Function (including performance) for an Inertial Navigation Unit (INU) applicable to a broad spectrum of vehicles. It is the intent of this specification to define the INU requirements such that multiple contractor designed and produced hardware can be used interchangeably at the Line Replaceable Unit (LRU) level in any given vehicle. The unique CDU interface is no longer part of this specification, and is now covered in SNU 84.1/F-16.

DTIC

Military Vehicles; Inertial Navigation; Range (Extremes)

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980017031 NERAC, Inc., Tolland, CT USA

Helicopters: Vibration Analysis. (Latest Citations from the NTIS Bibliographic Database)

Nov. 1995; In English; Page count unavailable.

Report No.(s): PB96-855358; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning rotor induced vibration in helicopters and rotary wing aircraft. Topics include coupled rotor/airframe vibration analysis, the influence of atmospheric turbulence on vibration, model and full scale wind tunnel testing, and flight and ground tests. Methods of vibration reduction are investigated, including blade tip sweep, blade tip design optimization, blade tabs, and vibration isolators. Adaptive control systems are discussed in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Helicopters; Rotary Wing Aircraft; Vibration Effects; Bibliographies

19980017222 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France

Revision Summary Document for the Base of Aircraft Data (BADA)

Bos, A., European Organization for the Safety of Air Navigation, France; Jan. 1997; 47p; In English

Report No.(s): PB97-140826; EEC/NOTE-2/97-Rev; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Revision Summary Document (RSD) describes all changes made to BADA files in Revision 2.5 since the previous release, Revision 2.4. Configuration management procedures for BADA trace all changes through configuration Change Orders (CCOs). The RSD thus presents a list of all 30 CCOs implemented for BADA 2.5 along with a description for each CCO.

NTIS

Configuration Management; Operations Research

19980017259 Old Dominion Coll., College of Engineering and Technology, Norfolk, VA USA

Impact and Penetration Simulations for Composite Wing-like Structures Final Report

Knight, Norman F., Old Dominion Coll., USA; Jan. 30, 1998; 33p; In English

Contract(s)/Grant(s): NAG1-1858

Report No.(s): NASA/CR-1998-206825; NAS 1.26:206825; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this research project was to develop methodologies for the analysis of wing-like structures subjected to impact loadings. Low-speed impact causing either no damage or only minimal damage and high-speed impact causing severe laminate damage and possible penetration of the structure were to be considered during this research effort. To address this goal, an assessment of current analytical tools for impact analysis was performed. Assessment of the analytical tools for impact and penetration simulations with regard to accuracy, modeling, and damage modeling was considered as well as robustness, efficient, and usage in a wing design environment. Following a qualitative assessment, selected quantitative evaluations will be performed using the leading simulation tools. Based on this assessment, future research thrusts for impact and penetration simulation of composite wing-like structures were identified.

Derived from text

Composite Structures; Structural Analysis; Impact Damage; Penetration; Laminates; Wings; Computerized Simulation

19980017299 NASA Ames Research Center, Moffett Field, CA USA

Design and Development of a Dynamically Deforming Leading Edge Airfoil for Unsteady Flow Control

Chandrasekhara, M. S., Naval Postgraduate School, USA; Carr, L. W., Army Aviation Systems Command, USA; Wilder, M. C., MCAT Inst., USA; Paulson, G. N., NASA Ames Research Center, USA; Sticht, C. D., NASA Ames Research Center, USA; Oct. 1997; 10p; In English

Contract(s)/Grant(s): ARO-MIPR-133-94

Report No.(s): AD-A332264; NASA/TM/97-206759; NAS 1.15:206759; ARO-32480.11-EG; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A novel approach to unsteady flow separation and dynamic stall control using a dynamically deforming leading edge airfoil is described. The design details of a carbon-fiber composite skin airfoil having a thickness of 0.002 in. at the leading edge and capable of deforming at 20 Hz in unsteady flow at freestream Mach numbers of up to 0.45, are discussed. Implementation of the scheme at model scales places extraordinary demands on the design, material and fabrication of such an airfoil. Rate scaling further requires very-rapid-response instrumentation, measurement techniques and data acquisition schemes. The special instrumentation control system developed for these experiments as well as the fluid dynamic results of successful flow control that was achieved using this method, are also discussed.

DTIC

Separated Flow; Unsteady Flow; Aerodynamic Stalling; Mach Number; Airfoils

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

19980017168 NASA Lewis Research Center, Cleveland, OH USA

Optimization of Jet Mixing Into a Rich, Reacting Crossflow

Leong, M. Y., California Univ., USA; Samuelson, G. S., California Univ., USA; Holdeman, J. D., NASA Lewis Research Center, USA; Dec. 1997; 16p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP-537-02-20

Report No.(s): NASA/TM-97-206294; E-10978; NAS 1.15:206294; AIAA Paper 98-0156; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Radial jet mixing of pure air into a fuel-rich, reacting crossflow confined to a cylindrical geometry is addressed with a focus on establishing an optimal jet orifice geometry. The purpose of this investigation was to determine the number of round holes that most effectively mixes the jets with the mainstream flow, and thereby minimizes the residence time of near-stoichiometric and unreacted packets. Such a condition might reduce pollutant formation in axially staged, gas turbine combustor systems. Five different configurations consisting of 8, 10, 12, 14, and 18 round holes are reported here. An optimum number of jet orifices is found for a jet-to-mainstream momentum-flux ratio (J) of 57 and a mass-flow ratio (MR) of 2.5. For this condition, the 14-orifice case produces the lowest spatial unmixedness and the most uniformly-distributed species concentrations and temperature profiles at a plane located one duct diameter length from the jet orifice inlet.

Author

Jet Mixing Flow; Cross Flow; Combustion Chambers; Gas Turbines; Orifices

19980017196 United Technologies Corp., Pratt and Whitney, East Hartford, CT USA

Advanced Low-Noise Research Fan Stage Design Final Report

Neubert, Robert, United Technologies Corp., USA; Bock, Larry, United Technologies Corp., USA; Malmberg, Eric, United Technologies Corp., USA; Owen-Peer, William, United Technologies Corp., USA; Dec. 1997; 70p; In English

Contract(s)/Grant(s): NAS3-26618; RTOP-538-03-12-00

Report No.(s): NASA/CR-97-206308; E-11006; NAS 1.26:206308; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes the design of the Advanced Low-Noise Research Fan stage. The fan is a variable pitch design, which is designed at the cruise pitch condition. Relative to the cruise setting, the blade is closed at takeoff and opened for reverse thrust operation. The fan stage is a split flow design with fan exit guide vanes (FEGVs) and core stators. The fan stage design is combined with a nacelle and engine core duct to form a powered fan/nacelle subscale model. This model is intended for use in combined

aerodynamic, acoustic, and structural testing in a wind tunnel. The fan has an outer diameter of 22 in. and a hub-to-tip of 0.426 in., which allows the use of existing NASA fan and cowl force balance and rig drive systems. The design parameters were selected to permit valid acoustic and aerodynamic comparisons with the Pratt & Whitney (P&W) 17- and 22-in. rigs previously tested under NASA contract. The fan stage design is described in detail. The results of the design axisymmetric and Navier-Stokes aerodynamic analysis are presented at the critical design conditions. The structural analysis of the fan rotor and attachment is included. The blade and attachment are predicted to have adequate low-cycle fatigue life and an acceptable operating range without resonant stress or flutter. The stage was acoustically designed with airfoil counts in the FEGV and core stator to minimize noise. A fan/FEGV tone analysis developed separately under NASA contract was used to determine the optimum airfoil counts. The fan stage was matched to the existing nacelle, designed under the previous P&W low-noise contract, to form a fan/nacelle model for wind tunnel testing. It is an axisymmetric nacelle for convenience in testing and analysis. Previous testing confirmed that the nacelle performed as required at various aircraft operating conditions.

Author

Turbofans; Low Noise; Navier-Stokes Equation; Ducted Fans; Computational Fluid Dynamics; Structural Design

19980017287 NASA Lewis Research Center, Cleveland, OH USA

Calculation of Multistage Turbomachinery Using Steady Characteristic Boundary Conditions

Chima, Rodrick V., NASA Lewis Research Center, USA; 1998; 18p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 523-26-13

Report No.(s): NASA/TM-1998-206613; E-11033; NAS 1.15:206613; AIAA Paper 98-0968; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A multiblock Navier-Stokes analysis code for turbomachinery has been modified to allow analysis of multistage turbomachines. A steady averaging-plane approach was used to pass information between blade rows. Characteristic boundary conditions written in terms of perturbations about the mean flow from the neighboring blade row were used to allow close spacing between the blade rows without forcing the flow to be axisymmetric. In this report the multiblock code is described briefly and the characteristic boundary conditions and the averaging-plane implementation are described in detail. Two approaches for averaging the flow properties are also described. A two-dimensional turbine stator case was used to compare the characteristic boundary conditions with standard axisymmetric boundary conditions. Differences were apparent but small in this low-speed case. The two-stage fuel turbine used on the space shuttle main engines was then analyzed using a three-dimensional averaging-plane approach. Computed surface pressure distributions on the stator blades and endwalls and computed distributions of blade surface heat transfer coefficient on three blades showed very good agreement with experimental data from two tests.

Author

Navier-Stokes Equation; Computational Fluid Dynamics; Pressure Distribution; Heat Transfer Coefficients; Multiblock Grids; Finite Difference Theory; Turbulence Models; Grid Generation (Mathematics); Turbines

19980017318 Illinois Univ. at Urbana-Champaign, Urbana, IL USA

Numerical Investigation of Hot Gas Ingestion by STOVL Aircraft Final Report

Vanka, S. P., Illinois Univ. at Urbana-Champaign, USA; Jan. 1998; 112p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG3-1026; RTOP 523-26-33

Report No.(s): NASA-CR-4769; NAS 1.26:4769; E-10676; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report compiles the various research activities conducted under the auspices of the NASA Grant NAG3-1026, "Numerical Investigation of Hot Gas Ingestion by STOVL Aircraft" during the period of April 1989 to April 1994. The effort involved the development of multigrid based algorithms and computer programs for the calculation of the flow and temperature fields generated by Short Take-off and Vertical Landing (STOVL) aircraft, while hovering in ground proximity. of particular importance has been the interaction of the exhaust jets with the head wind which gives rise to the hot gas ingestion process. The objective of new STOVL designs to reduce the temperature of the gases ingested into the engine. The present work describes a solution algorithm for the multi-dimensional elliptic partial-differential equations governing fluid flow and heat transfer in general curvilinear coordinates. The solution algorithm is based on the multigrid technique which obtains rapid convergence of the iterative numerical procedure for the discrete equations. Initial efforts were concerned with the solution of the Cartesian form of the equations. This algorithm was applied to a simulated STOVL configuration in rectangular coordinates. In the next phase of the work, a computer code for general curvilinear coordinates was constructed. This was applied to model STOVL geometries on curvilinear grids. The code was also validated in model problems. In all these efforts, the standard k-Epsilon model was used.

Author

STOVL Aircraft; High Temperature Gases; Flow Distribution; Exhaust Gases; Vertical Landing; Heat Transfer

19980017776 NASA Lewis Research Center, Cleveland, OH USA

Fuel Injector Patterning Evaluation in Advanced Liquid-Fueled, High Pressure, Gas Turbine Combustors, Using Non-intrusive Optical Diagnostic Techniques

Locke, R. J., NYMA, Inc., USA; Hicks, Y. R., NASA Lewis Research Center, USA; Anderson, R. C., NASA Lewis Research Center, USA; Zaller, M. M., NASA Lewis Research Center, USA; Feb, 1998; 16p; In English; 34th; JANNAF CS/PSHS/APS Joint Meeting, 27-31 Oct. 1997, West Palm Beach, FL, USA; Sponsored by Johns Hopkins Univ., USA; Original contains color illustrations

Contract(s)/Grant(s): NAS3-27186; RTOP 538-06-12

Report No.(s): NASA/TM-1998-206292; NAS 1.15:206292; E-10977; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Planar laser-induced fluorescence (PLIF) imaging and planar Mie scattering are used to examine the fuel distribution pattern (patterning) for advanced fuel injector concepts in kerosene burning, high pressure gas turbine combustors. Three diverse fuel injector concepts for aerospace applications were investigated under a broad range of operating conditions. Fuel PLIF patterning results are contrasted with those obtained by planar Mie scattering. Further comparison is also made for one injector with data obtained through phase Doppler measurements. Differences in spray patterns for diverse conditions and fuel injector configurations are readily discernible. An examination of the data has shown that a direct determination of the fuel spray angle at realistic conditions is also possible. The results obtained in this study demonstrate the applicability and usefulness of these nonintrusive optical techniques for investigating fuel spray patterning under actual combustor conditions.

Author

Laser Induced Fluorescence; Fuel Injection; Nonintrusive Measurement; Liquid Fuels

08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

19980017530 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

Unified Theory for Aircraft Handling Qualities and Adverse Aircraft-Pilot Coupling

Hess, R. A., California Univ., USA; Journal of Guidance, Control and Dynamics; 1997; Volume 20, No. 6, pp. 1141-1148; In English; 35th; Aerospace Sciences Meeting, 6-9 Jan. 1997, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAG1-1744

Report No.(s): NASA/CR-1997-207115; NAS 1.26:207115; AIAA Paper 97-0454; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A unified theory for aircraft handling qualities and adverse aircraft-pilot coupling or pilot-induced oscillations is introduced. The theory is based on a structural model of the human pilot. A methodology is presented for the prediction of (1) handling qualities levels; (2) pilot-induced oscillation rating levels; and (3) a frequency range in which pilot-induced oscillations are likely to occur. Although the dynamics of the force-feel system of the cockpit inceptor is included, the methodology will not account for effects attributable to control sensitivity and is limited to single-axis tasks and, at present, to linear vehicle models. The theory is derived from the feedback topology of the structural model and an examination of flight test results for 32 aircraft configurations simulated by the U.S. Air Force/CALSPAN NT-33A and Total In-Flight Simulator variable stability aircraft. An extension to non-linear vehicle dynamics such as that encountered with actuator saturation is discussed.

Author

Aircraft Control; Aircraft Pilots; Pilot Induced Oscillation; Frequency Ranges; Actuators; Controllability; Aircraft Configurations

19980017538 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

Flight Control System Design with Rate Saturating Actuators

Hess, R. A., California Univ., USA; Snell, S. A., California Univ., USA; Journal of Guidance, Control and Dynamics; 1997; Volume 20, No. 1, pp. 90-96; In English

Contract(s)/Grant(s): NAG1-1744

Report No.(s): NASA/CR-97-207117; NAS 1.26:207117; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Actuator rate saturation is an important factor adversely affecting the stability and performance of aircraft flight control systems. It has been identified as a catalyst in pilot-induced oscillations, some of which have been catastrophic. A simple design technique is described that utilizes software rate limiters to improve the performance of control systems operating in the presence of actuator rate saturation. As described, the technique requires control effectors to be ganged such that any effector is driven by only a single compensated error signal. Using an analysis of the steady-state behavior of the system, requirements are placed upon the type of the loop transmissions and compensators in the proposed technique. Application of the technique to the design of a multi-input/multi-output, lateral-directional control system for a simple model of a high-performance fighter is demonstrated as are the stability and performance improvements that can accrue with the technique.

Author

Flight Control; Control Systems Design; Actuators; Error Signals; Compensators; Aircraft Control; Pilot Induced Oscillation; Catalysts

19980017615 NASA Dryden Flight Research Center, Edwards, CA USA

A Worst-Case Approach for On-Line Flutter Prediction

Lind, Rick C., NASA Dryden Flight Research Center, USA; Brenner, Martin J., NASA Dryden Flight Research Center, USA; 1998; 8p; In English

Report No.(s): NASA/TM-1997-207056; NAS 1.15:207056; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Worst-case flutter margins may be computed for a linear model with respect to a set of uncertainty operators using the structured singular value. This paper considers an on-line implementation to compute these robust margins in a flight test program. Uncertainty descriptions are updated at test points to account for unmodeled time-varying dynamics of the airplane by ensuring the robust model is not invalidated by measured flight data. Robust margins computed with respect to this uncertainty remain conservative to the changing dynamics throughout the flight. A simulation clearly demonstrates this method can improve the efficiency of flight testing by accurately predicting the flutter margin to improve safety while reducing the necessary flight time.

Author

Aeroelasticity; On-Line Systems; Flutter Analysis; Prediction Analysis Techniques; Flutter; Flight Tests; Dynamic Structural Analysis

19980017705 Missouri Univ., Dept. of Mechanical and Aerospace Engineering, Rolla, MO USA

Hypersonic Vehicle Trajectory Optimization and Control Final Report

Balakrishnan, S. N., Missouri Univ., USA; Shen, J., Missouri Univ., USA; Grohs, J. R., Missouri Univ., USA; Jul. 1997; 64p; In English

Contract(s)/Grant(s): NAG1-1728; NSF ECS-93-13946

Report No.(s): NASA/CR-97-206809; NAS 1.26:206809; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Two classes of neural networks have been developed for the study of hypersonic vehicle trajectory optimization and control. The first one is called an 'adaptive critic'. The uniqueness and main features of this approach are that: (1) they need no external training; (2) they allow variability of initial conditions; and (3) they can serve as feedback control. This is used to solve a 'free final time' two-point boundary value problem that maximizes the mass at the rocket burn-out while satisfying the pre-specified burn-out conditions in velocity, flightpath angle, and altitude. The second neural network is a recurrent network. An interesting feature of this network formulation is that when its inputs are the coefficients of the dynamics and control matrices, the network outputs are the Kalman sequences (with a quadratic cost function); the same network is also used for identifying the coefficients of the dynamics and control matrices. Consequently, we can use it to control a system whose parameters are uncertain. Numerical results are presented which illustrate the potential of these methods.

Derived from text

Neural Nets; Hypersonic Vehicles; Trajectory Optimization; Dynamic Control; Feedback Control; Boundary Value Problems

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

19980017111 National Inst. of Standards and Technology, Electromagnetic Fields Div., Boulder, CO USA

TEM/Reverberating Chamber Electromagnetic Radiation Test Facility at Rome Laboratory

Crawford, M. L., National Inst. of Standards and Technology, USA; Riddle, B. F., National Inst. of Standards and Technology,

USA; Camell, D. G., National Inst. of Standards and Technology, USA; Jan. 1996; 75p; In English
Report No.(s): PB96-155023; NISTIR-5002; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes the measurement and evaluation of a TEM/reverberating chamber. This chamber was developed as a single, integrated facility for testing radiated electromagnetic compatibility/vulnerability (EMC/V) of large systems over the frequency range of 10 kHz to 18 GHz or higher. The facility consists of a large shielded enclosure configured as a transverse electromagnetic (TEM) transmission line-driven reverberating chamber. TEM mode test fields are generated at frequencies below multimode cutoff, and mode-stirred test fields are generated at frequencies above multimode cutoff. The report discusses the basis for such a development including the theoretical concepts, the advantages and limitations, the experiments approach for evaluating the operational parameters, and the procedures for using the chamber to perform EMC/V measurements. Both the chamber's cw and pulsed rf characteristics are measured and analyzed.

NTIS

Electromagnetic Radiation; Continuous Radiation; Reverberation; Electromagnetic Compatibility; Test Facilities

19980017122 California Univ., Santa Cruz, CA USA

Guidance on Establishing Trace Metal Clean Rooms in Existing Facilities, January 1996

Flegal, A. R., California Univ., USA; Jan. 1996; 21p; In English

Report No.(s): PB96-193321; EPA/821/B-96/001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The guidance document provides a mix of what is optimal and what is acceptable in establishing trace metal clean laboratories within existing facilities. It is based on experience rather than specific engineering designs. This experience also includes constructing three 'temporary' (one is now ten years old) trace metal clean laboratories in existing facilities and designing a trace metal clean laboratory in a new building. The design of each laboratory was based on numerous discussions of the advantages and disadvantages of different designs with numerous other uses of trace metal clean laboratories.

NTIS

Clean Rooms; Laboratories; Trace Elements; Metals; Water Pollution

19980017802 Joint Test and Evaluation Directorate, White Sands Missile Range, NM USA

System Integration Test Linked Simulators Phase Final Report

Sturgeon, Steven J., Joint Test and Evaluation Directorate, USA; McKee, Leslie L., Joint Test and Evaluation Directorate, USA; Jul. 1997; 352p; In English

Contract(s)/Grant(s): DAAH01-95-C-0310

Report No.(s): AD-A332057; DMSTTIAC-SOAR-98-01; JADS/JTE-TR-97-001; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The Linked Simulators Phase (LSP) of the Systems Integration Test (SIT) was executed by the Joint Advanced Distributed Simulation (JADS) Joint Test Force (JTF) and the Naval Air Warfare Center, Weapons Division (NAWCWPNS) between August and November 1996. The purpose of the SIT is to evaluate the utility of using advanced distributed simulations (ADS) to support cost-effective testing of an integrated missile weapon/launch aircraft system in an operationally realistic scenario. This was accomplished in the LSP by replicating an actual live test in which a single shooter aircraft launched an AIM-9M missile against a single target aircraft. In the LSP, the shooter, target, and missile were all represented by simulation laboratories. ADS were used to link NAWCWPNS manned flight laboratories representing the aircraft to an air-to-air missile hardware-in-the-loop (HWIL) laboratory representing the missile. This report details the results of executing the LSP, including validity of the AIM-9M data acquired, utility of the LSP configuration for parametric studies, effects of latency on test results, and the ability of the ADS network to support the testing.

DTIC

Simulators; Systems Integration; Simulation; Distributed Interactive Simulation

19980017921 Naval Surface Warfare Center, Dahlgren, VA USA

Hypervelocity Wind Tunnel No. 9 Mach 7 Thermal Structural Facility Verification and Calibration Final Report

Lafferty, John F., Naval Surface Warfare Center, USA; Marren, Daniel E., Naval Surface Warfare Center, USA; Jun. 1996; 70p; In English

Report No.(s): AD-A329697; NSWCDD/TR-95/231; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes the verification and calibration of the new Mach 7 Thermal Structural Facility located at the White Oak, Maryland, site of the Dahlgren Division, Naval Surface Warfare Center. This effort was in support of the development of a thermal structural ground testing capability for interceptor seeker windows and radomes. The new facility is located in the Hypervelocity Wind Tunnel No. 9 complex and uses common gas supply and vacuum source hardware. Test included the initial

facility operation as well as a detailed calibration at three specific design points. Calibration data were collected using a Pitot-probe rake and a blunt sphere cone, each mounted at multiple locations in the test cell to fully characterize the test environment. The Thermal Structural Facility achieves Mach 7 flow conditions with freestream pressures and temperatures equivalent to ambient pressures and temperatures for altitudes between 38,000 and 67,000 ft (11.5 and 20.5 km) for test times up to 5 sec. This ground test facility provides the capability necessary to test full-scale interceptor seeker windows in a true aero-thermal environment without the need for scaling.

DTIC

Hypersonic Wind Tunnels; Hypervelocity Wind Tunnels; Calibrating

10

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

19980017619 NASA Lewis Research Center, Cleveland, OH USA

Comparison of High Aspect Ratio Cooling Channel Designs for a Rocket Combustion Chamber with Development of an Optimized Design

Wadel, Mary F., NASA Lewis Research Center, USA; Jan. 1998; 78p; In English

Contract(s)/Grant(s): RTOP 242-72-01

Report No.(s): NASA/TM-1998-206313; NAS 1.15:206313; E-10996; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An analytical investigation on the effect of high aspect ratio (height/width) cooling channels, considering different coolant channel designs, on hot-gas-side wall temperature and coolant pressure drop for a liquid hydrogen cooled rocket combustion chamber, was performed. Coolant channel design elements considered were: length of combustion chamber in which high aspect ratio cooling was applied, number of coolant channels, and coolant channel shape. Seven coolant channel designs were investigated using a coupling of the Rocket Thermal Evaluation code and the Two-Dimensional Kinetics code. Initially, each coolant channel design was developed, without consideration for fabrication, to reduce the hot-gas-side wall temperature from a given conventional cooling channel baseline. These designs produced hot-gas-side wall temperature reductions up to 22 percent, with coolant pressure drop increases as low as 7.5 percent from the baseline. Fabrication constraints for milled channels were applied to the seven designs. These produced hot-gas-side wall temperature reductions of up to 20 percent, with coolant pressure drop increases as low as 2 percent. Using high aspect ratio cooling channels for the entire length of the combustion chamber had no additional benefit on hot-gas-side wall temperature over using high aspect ratio cooling channels only in the throat region, but increased coolant pressure drop 33 percent. Independent of coolant channel shape, high aspect ratio cooling was able to reduce the hot-gas-side wall temperature by at least 8 percent, with as low as a 2 percent increase in coolant pressure drop. The design with the highest overall benefit to hot-gas-side wall temperature and minimal coolant pressure drop increase was the design which used bifurcated cooling channels and high aspect ratio cooling in the throat region. An optimized bifurcated high aspect ratio cooling channel design was developed which reduced the hot-gas-side wall temperature by 18 percent and reduced the coolant pressure drop by 4 percent. Reductions of coolant mass flow rate of up to 50 percent were possible before the hot-gas-side wall temperature reached that of the baseline. These mass flow rate reductions produced coolant pressure drops of up to 57 percent.

Author

High Aspect Ratio; Cooling; Combustion Chambers; Pressure Drop; Rocket Engines

11

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19980017268 Lockheed Martin Engineering and Sciences Co., Hampton, VA USA

Translaminar Fracture Toughness of a Composite Wing Skin Made of Stitched Warp-knit Fabric Final Report

Masters, John E., Lockheed Martin Engineering and Sciences Co., USA; Nov. 1997; 30p; In English

Contract(s)/Grant(s): NAS1-96014; RTOP 538-10-11-05

Report No.(s): NASA/CR-201728; NAS 1.26:201728; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of tests were conducted to measure the fracture toughness of carbon/epoxy composites. The composites were made from warp-knit carbon fabric and infiltrated with epoxy using a resin-film-infusion process. The fabric, which was designed by McDonnell Douglas for the skin of an all-composite subsonic transport wing, contained fibers in the 0 deg, +/-45 deg, and 90 deg directions. Layers of fabric were stacked and stitched together with Kevlar yarn to form a 3-dimensional preform. Three types of test specimens were evaluated: compact tension, center notch tension, and edge notch tension. The effects of specimen size and crack length on fracture toughness were measured for each specimen type. These data provide information on the effectiveness of the test methods and on general trends in the material response. The scope of the investigation was limited by the material that was available.

Author

Fracture Strength; Textiles; Resin Film Infusion; Carbon Fibers; Epoxy Resins; Wings; Composite Structures; Tensile Tests

19980017394 Georgia Inst. of Tech., Atlanta, GA USA

Environmental Durability of Adhesively Bonded Joints

Butkus, Lawrence M., Georgia Inst. of Tech., USA; Oct. 14, 1997; 348p; In English

Report No.(s): AD-A330646; AFIT-97-028D; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The goal of this project was to evaluate the environmental durability of adhesively bonded aircraft joints using fracture mechanics and the strain energy release rate concept. Three bonded aerospace material systems, two epoxies and one polyimide, were investigated. Adhesive specimens were tested for tensile and toughness behavior. Bonded joint specimens were subject to Mode I, Mode II, and mixed mode fracture tests and to Mode I fatigue tests. Prior to testing, selected specimens were exposed for up to 10,000 hours to isothermal and thermally cyclic conditions simulating aircraft service environments. Analysis was accomplished using finite element programs and closed-form solutions. Environmental exposure caused reductions in the failure strain, strength, and toughness, of the adhesive specimens and in the toughness and fatigue threshold of the bonded joint specimens. Specimens exposed to high temperature and humidity prior to testing and those tested at low temperatures indicative of high altitude operations experienced the most significant toughness losses. The fatigue crack growth rate sensitivity appeared to be unaffected by environmental exposure. Results are discussed in terms of their relationship to bonded joint design and should prove valuable to efforts aimed at extending the lives of aging aircraft using bonded repairs as well as to efforts focused on using adhesive bonding for future aerospace structures.

DTIC

Bonded Joints; Adhesive Bonding; Durability; Evaluation; Environmental Tests; Aircraft Structures

19980017547 NERAC, Inc., Tolland, CT USA

Ceramic Fibers as Reinforcing Material (Latest Citations from the NTIS Bibliographic Database)

Nov. 1995; In English; Page count unavailable

Report No.(s): PB96-855184; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development, manufacturing, and evaluation of ceramic fibers for use as reinforcing material. Mechanical properties, high temperature characteristics, structural stability, and thermochemical properties of ceramic fiber reinforced ceramic matrix composites and metal matrix composites are discussed. Citations also cover applications in gas turbine engines, space structures, cutting tools, optical/electronic units, and armors.

NTIS

Armor; Bibliographies; Ceramic Fibers; Ceramic Matrix Composites; Cutters; Gas Turbine Engines; High Temperature; Large Space Structures; Mechanical Properties; Metal Matrix Composites; Reinforcing Materials; Spacecraft Structures

12 ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19980017226 National Inst. of Standards and Technology, Building Environment Div., Gaithersburg, MD USA

Performance of R-22 Alternative Refrigerants in a System with Cross-Flow and Counter-flow Heat Exchangers

Kim, M. H., National Inst. of Standards and Technology, USA; Domanski, P. A., National Inst. of Standards and Technology, USA;

Didion, D. A., National Inst. of Standards and Technology, USA; Jan. 1997; 33p; In English
Report No.(s): PB97-138259; NISTIR-5945; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents results of performance tests of R-22 and four alternative fluids, R-134a, R-32/134a (30/70), R-407C, and R-410A, at opening conditions typical for a residential heat pump. The study was performed in an experimental breadboard water-to-water heat pump in which a water/ethylene glycol mixture was used as the heat-transfer fluid. The heat exchangers representing the indoor and outdoor coils were counter-flow, respectively. The cooling tests were conducted for all five fluids, and the heating tests were run for R-22 and R-407C. The report presents tests results for the system and data characterizing the performance of the heat exchangers and compressor. The zeotropic mixtures, R-32/134a and R-407A, had similar performance characteristics as R-22. At tests performed at the same capacity, R-410A had the highest Coefficient of Performance.

NTIS

Refrigerants; Heat Exchangers; Compressors; Cooling; Cross Flow; Ethylene Compounds

12 ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19980016933 Wilson Technologies, Inc., Ayr, Ontario Canada

Prototyping and Laboratory Testing an Oil-Free, Reciprocating Compressor Developed Specifically for Refueling Commercial Natural Gas for Vehicles (NGV) Fleets *Final Report, May 1994 - Mar. 1996*

Pennington, M. D., Wilson Technologies, Inc., Canada; Ender, T. C., Wilson Technologies, Inc., Canada; Mar. 1996; 29p; In English

Contract(s)/Grant(s): GRI-5093-493-2688

Report No.(s): PB97-104822; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Addressing a need for a compressor designed specifically for high pressure natural gas in the 20 to 50 standard cubic feet per minute (scfm) range, components were designed and successfully tested in the laboratory for an oil-free 50 scfm compressor. It was expected to find application in the natural gas vehicle refueling, where it is important to avoid oil carryover and to ensure cleaner burning natural gas, and where a need for a small compressor was perceived. However, a reevaluation of the market acknowledged the shift from this size of compressor to larger, faster-fill compressors, and the project was terminated.

NTIS

Compressed Gas; Compressors; Natural Gas; Refueling

19980016989 Cleveland State Univ., Cleveland, OH USA

Design Protocols and Analytical Strategies that Incorporate Structural Reliability Models *Final Report, 19 Jan. 1996 - 18 Jan. 1997*

Duffy, Stephen F., Cleveland State Univ., USA; 1997; 85p; In English

Contract(s)/Grant(s): NCC3-448

Report No.(s): NASA/CR-97-207097; NAS 1.26:207097; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Ceramic matrix composites (CMC) and intermetallic materials (e.g., single crystal nickel aluminide) are high performance materials that exhibit attractive mechanical, thermal and chemical properties. These materials are critically important in advancing certain performance aspects of gas turbine engines. From an aerospace engineer's perspective the new generation of ceramic composites and intermetallics offers a significant potential for raising the thrust/weight ratio and reducing NO(x) emissions of gas turbine engines. These aspects have increased interest in utilizing these materials in the hot sections of turbine engines. However, as these materials evolve and their performance characteristics improve a persistent need exists for state-of-the-art analytical methods that predict the response of components fabricated from CMC and intermetallic material systems. This need provided the motivation for the technology developed under this research effort. Continuous ceramic fiber composites exhibit an increase in work of fracture, which allows for "graceful" rather than catastrophic failure. When loaded in the fiber direction, these composites retain substantial strength capacity beyond the initiation of transverse matrix cracking despite the fact that neither of its constituents would exhibit such behavior if tested alone. As additional load is applied beyond first matrix cracking, the matrix tends to break in a series of cracks bridged by the ceramic fibers. Any additional load is born increasingly by the fibers until the ultimate strength of the composite is reached. Thus modeling efforts supported under this research effort have focused on predicting this sort of behavior. For single crystal intermetallics the issues that motivated the technology development involved questions relating

to material behavior and component design. Thus the research effort supported by this grant had to determine the statistical nature and source of fracture in a high strength, NiAl single crystal turbine blade material; map a simplistic failure strength envelope of the material; develop a statistically based reliability computer algorithm, verify the reliability model and computer algorithm, and model stator vanes for rig tests. Thus establishing design protocols that enable the engineer to analyze and predict the mechanical behavior of ceramic composites and intermetallics would mitigate the prototype (trial and error) approach currently used by the engineering community. The primary objective of the research effort supported by this short term grant is the continued creation of enabling technologies for the macroanalysis of components fabricated from ceramic composites and intermetallic material systems. The creation of enabling technologies aids in shortening the product development cycle of components fabricated from the new high technology materials.

Derived from text

Ceramic Matrix Composites; Intermetallics; Nickel Aluminides; Gas Turbine Engines; Fracture Strength; Structural Reliability; Mechanical Properties; Ceramic Fibers; Cracks; Computerized Simulation

19980017082 NASA Langley Research Center, Hampton, VA USA

Aeroheating Predictions for X-34 Using an Inviscid-Boundary Layer Method

Riley, Christopher J., NASA Langley Research Center, USA; Kleb, William L., NASA Langley Research Center, USA; Jan. 1998; 30p; In English

Contract(s)/Grant(s): RTOP 242-80-01-01

Report No.(s): NASA/TM-1998-206906; NAS 1.15:206906; L-17688; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Radiative equilibrium surface temperatures and surface heating rates from a combined inviscid-boundary layer method are presented for the X-34 Reusable Launch Vehicle for several points along the hypersonic descent portion of its trajectory. Inviscid, perfect-gas solutions are generated with the Langley Aerothermodynamic Upwind Relaxation Algorithm (LAURA) and the Data-Parallel Lower-Upper Relaxation (DPLUR) code. Surface temperatures and heating rates are then computed using the Langley Approximate Three-Dimensional Convective Heating (LATCH) engineering code employing both laminar and turbulent flow models. The combined inviscid-boundary layer method provides accurate predictions of surface temperatures over most of the vehicle and requires much less computational effort than a Navier-Stokes code. This enables the generation of a more thorough aerothermal database which is necessary to design the thermal protection system and specify the vehicle's flight limits.

Author

X-34 Reusable Launch Vehicle; Aerodynamic Heating; Boundary Layers; Hypersonics; Convective Heat Transfer; Mathematical Models; Algorithms

13 GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

19980017933 Environmental Protection Agency, Ada, OK USA

Pilot Demonstration of Nitrate-Based Bioremediation of Fuel-Contaminated-Aquifer at Eglin AFB, Florida: Site Characterization, Design, and Performance Evaluation Final Report, Oct. 1992 - Sep. 1996

Hutchins, S. R., Environmental Protection Agency, USA; Miller, D. E., Environmental Protection Agency, USA; Thomas, J. M., Environmental Protection Agency, USA; Ward, C. H., Environmental Protection Agency, USA; Wiesner, M. R., Rice Univ., USA; Apr. 1997; 240p; In English

Contract(s)/Grant(s): MIPR-92-65

Report No.(s): AD-A332940; AL/EQ-TR-1996-0034; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The objective of this research was to compare the extent of bioremediation of a fuel-contaminated aquifer using aerobic recharge with and without nitrate addition. This research was undertaken to provide a direct comparison through the operation of a pilot project at a JP-4 jet fuel-contaminated aquifer at Eglin AFB, FL. Nitrate can serve as an electron acceptor and results in anaerobic biodegradation of organic compounds via the processes of nitrate reduction and denitrification. Because nitrate is less expensive and more soluble than oxygen, it may be more economical to remediate fuel-contaminated aquifers using nitrate rather than oxygen. The pilot project treatment system consisted of two adjacent 100-foot x 100-foot cells that received nitrate-amended and unamended recharge, respectively, through sprinkler application. Performance was continuously monitored through the use of both conventional and cluster wells located within and outside of the treatment cells. Performance evaluation, consisting

of extensive chemical, microbial, and toxicological analyses of aquifer sediments and groundwater, were conducted after 4 and 12 months of operation to provide a thorough evaluation of the extent of nitrate-based bioremediation. Results showed recharge application had a positive effect on both cells, resulting in decreased contaminant loads, increased nutrient distribution, increased microbial populations, and decreased sediment toxicity.

DTIC

Denitrogenation; Ground Water; JP-4 Jet Fuel; Loads (Forces); Microorganisms; Organic Compounds; Acceptor Materials; Performance Tests

14 LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19980016965 Ohio State Univ., Cognitive Systems Engineering Lab., Columbus, OH USA

Learning from Automation Surprises and "Going Sour" Accidents: Progress on Human-Centered Automation Final Report

Woods, David D., Ohio State Univ., USA; Sarter, Nadine B., Illinois Univ., USA; Jan. 19, 1998; 42p; In English

Contract(s)/Grant(s): NCC2-592; NCC1-209

Report No.(s): NASA/CR-1998-207061; NAS 1.26:207061; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Advances in technology and new levels of automation on commercial jet transports has had many effects. There have been positive effects from both an economic and a safety point of view. The technology changes on the flight deck also have had reverberating effects on many other aspects of the aviation system and different aspects of human performance. Operational experience, research investigations, incidents, and occasionally accidents have shown that new and sometimes surprising problems have arisen as well. What are these problems with cockpit automation, and what should we learn from them? Do they represent over-automation or human error? Or instead perhaps there is a third possibility - they represent coordination breakdowns between operators and the automation? Are the problems just a series of small independent glitches revealed by specific accidents or near misses? Do these glitches represent a few small areas where there are cracks to be patched in what is otherwise a record of outstanding designs and systems? Or do these problems provide us with evidence about deeper factors that we need to address if we are to maintain and improve aviation safety in a changing world? How do the reverberations of technology change on the flight deck provide insight into generic issues about developing human-centered technologies and systems (Winograd and Woods, 1997)? Based on a series of investigations of pilot interaction with cockpit automation (Sarter and Woods, 1992; 1994; 1995; 1997a, 1997 b), supplemented by surveys, operational experience and incident data from other studies (e.g., Degani et al., 1995; Eldredge et al., 1991; Tenney et al., 1995; Wiener, 1989), we too have found that the problems that surround crew interaction with automation are more than a series of individual glitches. These difficulties are symptoms that indicate deeper patterns and phenomena concerning human-machine cooperation and paths towards disaster. In addition, we find the same kinds of patterns behind results from studies of physician interaction with computer-based systems in critical care medicine (e.g., Moll van Charante et al., 1993; Obradovich and Woods, 1996; Cook and Woods, 1996). Many of the results and implications of this kind of research are synthesized and discussed in two comprehensive volumes, Billings (1996) and Woods et al. (1994). This paper summarizes the pattern that has emerged from our research, related research, incident reports, and accident investigations. It uses this new understanding of why problems arise to point to new investment strategies that can help us deal with the perceived "human error" problem, make automation more of a team player, and maintain and improve safety.

Author

Aircraft Safety; Flight Safety; Human Performance; Man Machine Systems; Pilot Performance; Human Factors Engineering; Automatic Control; Pilot Support Systems; Transport Aircraft

19980017145 NASA Johnson Space Center, Houston, TX USA

Multimodal Perception and Multicriterion Control of Nested Systems, 1, Coordination of Postural Control and Vehicular Control

Riccio, Gary E., Nascent Technologies Ltd., USA; McDonald, P. Vernon, National Space Biomedical Research Inst., USA; Jan. 1998; 74p; In English

Report No.(s): NASA/TP-3703; S-835; NAS 1.60:3703; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of this report is to identify the essential characteristics of goal-directed whole-body motion. The report is organized into three major sections (Sections 2, 3, and 4). Section 2 reviews general themes from ecological psychology and control-systems engineering that are relevant to the perception and control of whole-body motion. These themes provide an organizational

framework for analyzing the complex and interrelated phenomena that are the defining characteristics of whole-body motion. Section 3 of this report applies the organization framework from the first section to the problem of perception and control of aircraft motion. This is a familiar problem in control-systems engineering and ecological psychology. Section 4 examines an essential but generally neglected aspect of vehicular control: coordination of postural control and vehicular control. To facilitate presentation of this new idea, postural control and its coordination with vehicular control are analyzed in terms of conceptual categories that are familiar in the analysis of vehicular control.

Author

Aircraft Control; Systems Engineering; Posture; Coordination

19980017549 NERAC, Inc., Tolland, CT USA

Anthropometry: Basic Studies and Applications (Latest Citations from the NTIS Bibliographic Database)

Nov. 1995; In English; Page count unavailable

Report No.(s): PB96-855143; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the utilization of anthropomorphic measurement techniques in the design of military and civilian clothing and equipment. Topics include motion studies, physical fitness surveys, the use of anatomical models, and gender comparisons pertaining to specific anthropometric variables. Aircraft seats and cabins, cockpit design, automobile safety equipment, and flotation devices are among the equipment types considered. Military and civilian population surveys, and recreational products are also discussed.

NTIS

Aircraft Compartments; Cockpits; Human Body; Physical Fitness; Populations; Safety Devices; Seats; Surveys

15

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19980017310 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

QFT Multi-Input, Multi-Output Design with Non-Diagonal, Non-Square Compensation Matrices Final Report

Hess, R. A., California Univ., USA; Henderson, D. K., California Univ., USA; World Congress International Federation of Automatic Control; 1996; Volume H, pp. 309-314; In English; 13th; World Congress International Federation of Automatic Control, 30 Jun. - 5 Jul. 1996, San Francisco, CA, USA; Sponsored by International Federation of Automatic Control, Germany
Contract(s)/Grant(s): NAG1-1744

Report No.(s): NASA/CR-96-207114; NAS 1.26:207114; Rept-2d-18-1; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

A technique for obtaining a non-diagonal compensator for the control of a multi-input, multi-output plant is presented. The technique, which uses Quantitative Feedback Theory, provides guaranteed stability and performance robustness in the presence of parametric uncertainty. An example is given involving the lateral-directional control of an uncertain model of a high-performance fighter aircraft in which redundant control effectors are in evidence, i.e. more control effectors than output variables are used.

Author

Directional Control; Robustness (Mathematics); Feedback; Aircraft Performance; Matrices (Mathematics); Stability; Flight Control

19980017355 Science Applications International Corp., Beavercreek, OH USA

Future Embedded Computer System Support Technologies (FEST)/Automated Validation (AUTOVAL), Volume 4, Testmaster Evaluation Report for the Automated Validation (AUTOVAL) Program Final Report, Sep. 1995 - Jul. 1996

Schaar, Alan D., Science Applications International Corp., USA; Walters, Steven A., Science Applications International Corp., USA; Jul. 1996; 193p; In English

Contract(s)/Grant(s): F04606-89-D-0036; AF Proj. 3090

Report No.(s): AD-A333245; SAIC-RFFA56401-Vol-4; WL-TR-97-1112-Vol-4; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This report documents an evaluation of the TestMaster(trademark) Version 1.6 software commercial product within a pilot program and environment employing the Automated Validation (AutoVal) Version 3.00u toolset of Wright Laboratory, Avionics Directorate, System Concepts and Simulation Division, Software/Hardware Technology Branch (WL/AASH). The TestMaster(trademark) Pilot Program conducted by SMC assessed the performance and capabilities of the Teradyne TestMaster(trademark) commercial product for use in testing embedded Operational Flight Program (OFP) software in conjunction with WL/AASH's AutoVal toolset. This document describes the procedures followed and the results achieved during the TestMaster(trademark) Pilot Program. A brief background survey and examination of the Program goals and approach in Section 3.0 provides a framework for the discussion of test strategies and results analyzed in Section 4.0. In addition, the report addresses applicable metrics and offers recommendations for future action.

DTIC

Embedded Computer Systems; Computer Programs; Avionics

19980017376 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Admitting the Inadmissible: Adjoint Formulation for Incomplete Cost Functionals in Aerodynamic Optimization *Final Report*

Arian, Eyal, Institute for Computer Applications in Science and Engineering, USA; Salas, Manuel D., Institute for Computer Applications in Science and Engineering, USA; Dec. 1997; 18p; In English

Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-97-206269; NAS 1.26:206269; ICASE-97-69; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We derive the adjoint equations for problems in aerodynamic optimization which are improperly considered as "inadmissible." For example, a cost functional which depends on the density, rather than on the pressure, is considered "inadmissible" for an optimization problem governed by the Euler equations. We show that for such problems additional terms should be included in the Lagrangian functional when deriving the adjoint equations. These terms are obtained from the restriction of the interior PDE to the control surface. Demonstrations of the explicit derivation of the adjoint equations for "inadmissible" cost functionals are given for the potential, Euler, and Navier-Stokes equations.

Author

Navier-Stokes Equation; Functionals; Aerodynamics; Optimization; Compressible Flow; Boundary Value Problems

16 PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19980017136 National Aerospace Lab., Amsterdam, Netherlands

Hybrid Computational Model for Noise Propagation through a Fuselage Boundary Layer

Schippers, H., National Aerospace Lab., Netherlands; Wensing, J. A., National Aerospace Lab., Netherlands; Mar. 13, 1997; 14p; In English

Report No.(s): PB97-178875; NLR-TP-95125 U; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A hybrid computational model is presented to estimate scattering and refractive effects on the acoustic pressure waves through a boundary layer surrounding an aircraft's fuselage. The fuselage is represented by an infinitely long cylinder with a non-circular cross section. The propagation effects through the boundary layer can be significant and should be included in the noise predictions. The computational model uses finite elements to solve the acoustic pressure in the boundary layer area and boundary elements to calculate the pressure outside the boundary layer. An advantage of the model is that complicated geometries can be handled more easily than with prediction models which are based on analytical techniques. The computational model is applied to the non-circular cross section of a Fokker 50 like fuselage.

NTIS

Aeroacoustics; Fuselages; Computational Fluid Dynamics; Scattering; Electroacoustic Waves; Boundary Layers

19980017289 NASA Lewis Research Center, Cleveland, OH USA

Fan Noise Prediction: Status and Needs

Huff, Dennis L., NASA Lewis Research Center, USA; Dec. 1997; 18p; In English; 36th; Aerospace Sciences, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 538-03-11

Report No.(s): NASA/TM-97-206533; NAS 1.15:206533; E-11022; AIAA Paper-98-0177; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The prediction of fan noise is an important part to the prediction of overall turbofan engine noise. Advances in computers and better understanding of the flow physics have allowed researchers to compute sound generation from first principles and rely less on empirical correlations. While progress has been made, there are still many aspects of the problem that need to be explored. This paper presents some recent advances in fan noise prediction and suggests areas that still need further development. Fan noise predictions that support the recommendations are taken from existing publications.

Author

Noise Prediction; Aerodynamic Noise; Aeroacoustics; Turbofan Engines; Fluid Dynamics; Sound Generators

19980017944 NASA Lewis Research Center, Cleveland, OH USA

Noise from Supersonic Coaxial Jets, Part 1, Mean Flow Predictions

Dahl, Milo D., NASA Lewis Research Center, USA; Morris, Philip J., Pennsylvania State Univ., USA; Journal of Sound and Vibration; 1997; ISSN 0022-460X; Volume 200, No. 5, pp. 643-663; In English

Contract(s)/Grant(s): RTOP 505-62-52

Report No.(s): NASA/CR-97-207159; NAS 1.26:207159; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent theories for supersonic jet noise have used an instability wave noise generation model to predict radiated noise. This model requires a known mean flow that has typically been described by simple analytic functions for single jet mean flows. The mean flow of supersonic coaxial jets is not described easily in terms of analytic functions. To provide these profiles at all axial locations, a numerical scheme is developed to calculate the mean flow properties of a coaxial jet. The Reynolds-averaged, compressible, parabolic boundary layer equations are solved using a mixing length turbulence model. Empirical correlations are developed to account for the effects of velocity and temperature ratios and Mach number on the shear layer spreading. Both normal velocity profile and inverted velocity profile coaxial jets are considered. The mixing length model is modified in each case to obtain reasonable results when the two stream jet merges into a single fully developed jet. The mean flow calculations show both good qualitative and quantitative agreement with measurements in single and coaxial jet flows.

Author

Coaxial Flow; Jet Aircraft Noise; Noise Generators; Supersonic Jet Flow; Velocity Distribution; Boundary Layer Equations; Compressible Boundary Layer; Turbulence Models; Reynolds Averaging

17

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

19980017423 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA

The Research and Training Activities for the Joint Institute for Aeronautics and Acoustics Final Report, 1 Oct. 1997 - 30 Sep. 1998

Cantwell, Brian, Stanford Univ., USA; Sep. 1997; 51p; In English

Contract(s)/Grant(s): NCC2-55

Report No.(s): NASA/CR-97-206762; NAS 1.26:206762; AERO-97-52; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This proposal requests continued support for the program of activities to be undertaken by the Ames-Stanford Joint Institute for Aeronautics and Acoustics during the one-year period October 1, 1997 to September 30, 1998. The emphasis in this program is on training and research in experimental and computational methods with application to aerodynamics, acoustics and the important interactions between them. The program comprises activities in active flow control, Large Eddy Simulation of jet noise, flap aerodynamics and acoustics, high lift modeling studies and luminescent paint applications. During the proposed period there will be a continued emphasis on the interaction between NASA Ames, Stanford University and Industry, particularly in connection with the noise and high lift activities. The program will be conducted within the general framework of the Memorandum of Understanding (1976) establishing the Institute, as updated in 1993. As outlined in the agreement, the purposes of the Institute include the following: (1) to conduct basic and applied research; (2) to promote joint endeavors between Center scientists and those in the academic community; (3) to provide training to graduate students in specialized areas of aeronautics and acoustics through

participation in the research programs of the Institute; (4) to provide opportunities for Post-Doctoral Fellows to collaborate in research programs of the Institute; and (5) to disseminate information about important aeronautical topics and to enable scientists and engineers of the Center to stay abreast of new advances through symposia, seminars and publications.

Author

Aeroacoustics; Aerodynamics; Research; Computational Fluid Dynamics; University Program

Subject Term Index

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